



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

## XVI.

## A METHOD OF FILTRATION BY MEANS OF EASILY SOLUBLE AND EASILY VOLATILE FILTERS.

By F. A. GOOCH.

Communicated March 11, 1885.

THE processes of analysis, in which it is desirable to redissolve precipitates from the filter after washing, or to separate a mixed precipitate into parts by the action of appropriate solvents, are many.

When a complete solution is the object, and the precipitate yields easily to solvents which do not affect paper injuriously, the use of the ordinary filter offers no difficulty. When, however, precipitates are to be treated with reagents which disintegrate paper filters, the case is otherwise; and the attempt to remove, by solvents, any individual part of a mixed heterogeneous mass upon a filter, is always an uncertain matter. As examples of cases of this sort, difficult to deal with, we may take the solution of acid sodic titanate in strong hydrochloric acid; or, the purification of baric sulphate from included salts, by digestion in strong hydrochloric acid; or, the separation of sulphides which are soluble from those which are insoluble in alkaline sulphides; or, the washing out of free sulphur from precipitated sulphides by means of carbon disulphide; or, the separation of calcic and baric sulphates by the action of sodium hyposulphite. In cases of this nature it is often convenient to make use of the asbestos filter which I have previously described; \* but this sometimes has its disadvantages. Thus, to recur to the examples just cited, acid sodium titanate may be filtered and washed upon an asbestos filter, and felt and precipitate treated together with hydrochloric acid, but it will be impossible to determine when solution is effected because of the floating asbestos; and in separating the sulphides it would be necessary to know the weight of the asbestos felt, since it must be weighed finally with the insoluble sulphides, unless removed by a special treatment which involves the solution, filtration, and reprecipitation of the latter.

---

\* These Proceedings, Vol. XIII. p. 342.

It is to meet cases like these that I have sought a filter which, in the reversal of the ordinary mode of separating filter and precipitate, should dissolve easily in solvents which do not affect the ordinary precipitates met with in analysis. The material which seems best suited to the case — light and fluffy, capable of making secure filters of any desirable degree of porosity, sufficiently insoluble in water and aqueous solutions of salts, alkalies, and acids (excepting strong sulphuric, strong nitric, and glacial acetic acids), easily soluble in naphtha, benzol, carbon disulphide, ether, boiling alcohol, and essential oils, and not too costly — is anthracene.

The mode of preparing and using the filter is simple. Anthracene is slightly moistened with alcohol to make it miscible with water, diluted to the right consistency, and applied to the same apparatus, and in the same way, as the emulsion of asbestos which is employed in making asbestos felts. That is to say, enough of the emulsion in water to form a layer of the proper thickness is poured into a perforated crucible which is held tightly in a packing of rubber tubing stretched over a funnel fitted in the usual manner to a vacuum-flask or receiver. After washing with water the filter is ready for use. If the felt happens to be too coarse for the use of the moment, it may be made as close as need be by coating the felt first deposited with a finer emulsion, made by dissolving anthracene in hot alcohol and precipitating with water. When voluminous precipitates are to be filtered, the large perforated cone described in the former paper, to which I have referred, may be substituted with advantage for the crucible; or Cooke's improved form \* of Carmichael's process of reverse filtration may prove most useful. In using the cone it is well to apply the anthracene in a thick layer.

To remove the anthracene filter from a precipitate, it is only necessary to act with the proper solvent. It is usually convenient to stand the crucible containing precipitate and felt in a small beaker, add enough of the solvent, and gently warm until the anthracene dissolves. On the addition of water, or the reagent to work upon the precipitate, the solution of anthracene floats, and nothing remains to obstruct or obscure the action. If the precipitate dissolves entirely, the solution of anthracene may be separated from the aqueous solution by simply pouring the fluid upon a filter previously moistened with water, when the solution in water runs through, and the anthracene and its solvent remain and may be washed indefinitely with water.

---

\* These Proceedings, Vol. XII. p. 124.

If, on the other hand, the case is one of the division of precipitates, the anthracene and its solvent may be made to pass the filter, after the water has run through, by adding a little alcohol to overcome the repulsion between the solution and the water which fills the pores of the filter, the precipitate which stays behind being washed first with a solvent of anthracene, and then, if necessary, with alcohol followed by water; or, if the vacuum filter be used (either paper or asbestos, according to the circumstances of the case), both liquids leave the precipitate and traverse the filter together.

In general, I prefer benzol as the solvent for anthracene, but some advantage may be gained in special cases by a proper choice of solvents. Thus, in removing intermixed sulphur from precipitated sulphides, both the anthracene and the sulphur may be dissolved in carbon disulphide in a single operation.

The ready volatility of anthracene, at a temperature very near its melting point,  $213^{\circ}$  C., makes it easily separable in cases when to remove it by a solvent is not advisable. The treatment of a solution of anthracene, for example, with strong sulphuric or nitric acid, is apt to produce carbonaceous or gummy residues. In such cases it is well either to heat precipitate and filter directly, or to first remove them from the crucible by means of a solvent for anthracene, then evaporate this and raise the heat gently until the anthracene has vanished. The purification of precipitated baric sulphate, by dissolving it in hot, strong sulphuric acid, and reprecipitating by dilution, is a case in point; and one, too, in which the reversed filter may be used with great advantage. It may be remarked, in passing, that, if one does not happen to possess a platinum rose, and does happen to have at disposal a perforated crucible, a very fair reversed filter may be improvised of the crucible, a piece of glass tubing, and a rubber stopper, the last being fitted to the crucible, and the tube passed through nearly to the perforated bottom.

At every point in the preparation and use of the anthracene filter, I have found the manipulation peculiarly easy.